May 22, 1952

FINAL REPORT

Project Diogenes
Contract No. XG-814
Order No. 52-43354

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PROBLEM: To develop a beacon of high intensity visible only to devices such as the infrared sniperscope or equivalent, to be ground installed, with visibility from an airplane of approximately five miles and visibility from the ground of less than twenty yards with a slight visibility directly upward, the unit to be self-contained and to operate with as high a thermodynamic efficiency as possible in all kinds of weather, rain and wind conditions.

Additional problems in this development concern themselves with the question of the use of standard equipments wherever possible and, further, problems of packaging so that the devices may be stored for long times over wide ranges of temperature and humidity conditions.

GENERAL

Over the past four months numerous models of devices were made and tested within the laboratory and in the field. These tests included the measurement of the efficiencies of various types of sources from electrical to simple kerosene burners, including alcohol and some of the compressed gases. As a conclusion from these tests it was finally decided that the most efficient burner which would have the widest use throughout the world would be a Coleman lantern, Model No. 200, modified to operate so that visibility to the eye was practically zero and so that the necessary air for the burner would be available and at the same time not be affected by rain or wind. To obtain high efficiency in the general angle of the line of sight a red Fresnel lens was used. In order to protect the filter material which is susceptible to temperatures above 120°F two pyrex chimneys were inserted in the light path to permit upward air flow and at the same time to permit the filter to operate at ambient temperature. This lantern burns standard aviation gasoline and will run approximately eight hours without refilling. For highest efficiency it may be necessary to pump up the air chamber a second time during that period.

Field tests were made with standard model sniperscopes in conditions varying from zero to 50 or 60°F over ranges from a

few hundred yards to five miles. As a final test the final prototype design was subjected to high velocity fan, and swinging rapidly in the air by hand. Tests for rain-proofing, a garden hose squirted on the unit, were made. These tests were not able to extinguish the beacon.

DESIGN DESCRIPTION

The final unit, which seemed to offer the best solution in the time available, is shown in the accompanying set of prints which are detailed sufficiently so that any competent manufacturer can make them up. There is only one item of procurement (other than the Coleman lantern) which has to be obtained from a specific supplier and that is the XRX55 filter material and under a separate purchase order (Contract No. XG-781, Order No. 52-43350) 500 feet of this material 30 inches wide has been obtained from Polaroid Corporation. In manufacturing it is recommended that the Polaroid Corporation, attention Dr. Elkan R. Blout and Mr. John Mulhall, be asked to laminate the XRX55 in cylindrical form with sealed edges so that the maximum protection can be obtained for this material. In its final form the beacon will weigh approximately 11 pounds complete with fuel as an operating unit, without accessory equipment and without considering the packaging problem.

RECOMMENDATIONS

1. These units, to be made efficiently, should be made in quantities not less than 500 and the price will drop approximately 4 per cent for every additional 500.

2. Consideration has been given to the use of aluminum as compared with steel. The high operating temperature of the device seems to preclude the use of a material whose melting point is as low as aluminum, certainly for a large number of the metal pieces. The saving in weight would not be large because so many parts are of necessity made from glass or steel.

3. While a color other than black might be desirable from the point of view of visibility against ground backgrounds, it has been recommended that for security reasons black be made the color of the unit rather than some color such as olive drab.

4. With respect to packaging, a requirement was given to Mr. Ridgeley Shepherd of the United States Testing Laboratories who is familiar with the XRX55 material. The request was in the form of a question to U. S. Testing asking them what their recommendation would be for a material of the type XRX to be stored for six months in Panama. The final specification with respect to packaging must be made by others than ourselves and it is recommended that when a package is decided upon the whole unit be

tested by such an organization as U. S. Testing. The main problem is in the XRX material and the butyrate sheet which is used for a laminating material. The problem is one of moisture and fungus. It may well be that the simplest procedure will be to package these materials separately.

5. It is recommended, also, that for every ten units a set of spare parts containing extra mantles, a few wrenches and perhaps six extra lighters be supplied.

PRODUCTION

Drawings of the beacon have been sent to two possible suppliers. The general statement seems to be that in lots of 500 it is going to take approximately three months to deliver units of that order of magnitude if specifications can be arrived at for packaging.

Respectfully submitted,

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